

Blood lead levels in children and adolescents in Torreón, Mexico, 1999 -2009: an age, period, and cohort analysis

Alison B. Singer, *Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA*

Eliseo Guallar, MD, DrPH, *Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA and Department of Cardiovascular Epidemiology and Population Genetics, National Center for Cardiovascular Research (CNIC), Madrid, Spain*

Ellen K. Silbergeld, PhD, *Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA*

Ana Navas-Acien, MD, PhD, *Department of Environmental Health Sciences and Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA*

Marisela Rubio-Andrade, MD, *Facultad de Medicina, Universidad Juárez del Estado de Durango, Gómez Palacio Durango, México.*

Mario Rivera, MSc, *Secretaría de Salud del Estado de Coahuila, Coahuila, Mexico.*

Jorge Duron, MD, *Secretaría de Salud del Estado de Coahuila, Coahuila, Mexico.*

Virginia Weaver, MD, MPH, *Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA*

Stephen J. Rothenberg, PhD, *Instituto Nacional de Salud Publica, Centro de Investigación en Salud Poblacional, Cuernavaca, Morelos, Mexico.*

Gonzalo G. García-Vargas, MD, *Facultad de Medicina, Universidad Juárez del Estado de Durango, Gómez Palacio Durango, México.*

Background and Aims: Torreón, a large city in Northern Mexico, is home to the 4th largest lead smelter in the world. Previous studies indicate that children in Torreón are exposed to high levels of lead, but these studies used selected samples and did not track study participants over time. In 1999, officials in Torreón established a biomonitoring program for blood lead levels (BLLs) based on a census of children and adolescents in the communities surrounding the smelter. We describe age, period and cohort trends in BLLs in Torreón from 1999 to 2009 using data from the community biomonitoring program.

Methods: BLLs were available in 45,702 children and adolescents between January 1, 1999 and October 1, 2009. 31,383 (68.7%) participants had at least one additional measurement. We examined trends in BLL by calendar year and age using mixed models for longitudinal data.

Results: BLLs decreased from 1999 (median 18.5 $\mu\text{g/dL}$; 5th and 95th percentiles 6.4 – 48.5) to 2009 (median 4.5 $\mu\text{g/dL}$; 5th and 95th percentiles 1.9 – 11.3). The percentages of children and adolescents with a BLL above 10 $\mu\text{g/dL}$ were 89.1% in 1999 and 18.0% in 2009. BLLs peaked at around age one (median 9.6 $\mu\text{g/dL}$; 5th and 95th percentiles 2.7 – 32.1) and decreased thereafter. Boys had higher BLLs compared to girls (medians 8.5 vs. 7.8 $\mu\text{g/dL}$, respectively), and there was a sex by age interaction in BLLs (after the initial peak at early ages, BLLs in girls decreased faster than in boys).

Conclusions: BLLs in Torreón's children and adolescents have decreased markedly from 1999 to 2009, due in part to environmental remediation efforts. In spite of these changes, BLLs in children and adolescents in Torreón are still high compared to other Mexican and US areas.